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CANADIAN PATENT

⑤④ **SNOWMOBILE SKI SYSTEM**

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S P E C I F I C A T I O N

AN ABSTRACT OF THE INVENTION

A snowmobile ski having fins at its side and projecting downwardly and converging toward each other at their spaced rearward ends to compact snow under the ski for raising the forward end of the snowmobile, the fins assisting in turning because of their inclination with respect to the ski.

FIELD OF THE INVENTION

This invention is in the field of skis for snowmobiles, and more particularly those having downwardly extending fins.

DESCRIPTION OF THE PRIOR ART

Skis of the prior art used at the forward ends of snowmobiles have had downwardly offset center portions to provide the ski with strength and further have had wear bars replaceably attached to the undersides thereof and which extend downwardly from the centers thereof. The wear bars and offset portions
10. both cause the ski to cut a groove in the snow which is quite deep, thereby making the turning of the ski much more difficult than it would be if it had not cut a groove of such depth.

Fins have been placed on the bottom of skis in some isolated uses, but have never been popularly used, in my opinion, because fins of the prior art have been so constructed as to cut the undesired groove even deeper, making turning even more difficult.

Fins of the prior art have been disposed in parallelism with the ski, whereby they cannot assist in turning, and in ad-
20. dition even make turning more difficult.

Fins inclined outwardly from the longitudinal center of the skis have been discovered by my research to assist in the turning of the snowmobile, a concept absent from the prior art.

Snowmobiles of the prior art have had ski-mounting posts each having a post-axis inclining downwardly and forwardly from the underside of the chassis. Skis mounted on such inclined posts tend to incline in a direction favorable to turning, such inclining being laterally of the ski, and, during turning, I have discovered that if a fin is disposed
30. at the edge of a ski, that the ski will be lower at that side



of the ski on which the fin is mounted than it is on the opposite side of the same ski on which another fin is mounted at times when the ski is laterally inclined during turning and that this can cause one of the fins to have a greater grip on the snow than the other, as works out perfectly, in my opinion, for cooperation with the idea of having the fin inclined inwardly at its rearward end toward a longitudinal axis of the ski, thereby having the effect of turning the snowmobile more quickly in the direction of that side of the

10. ski which is lower. This causes the rearward end of the snowmobile to slide sideways in a favorable direction for turning the snowmobile even faster for that reason. In this way, a much more quickly maneuverable snowmobile is provided by my new concepts.

The prior art has never had a snowmobile ski in which fins at the side of the ski incline toward each other at their rearward ends. At first glance, this would seem ridiculous because it would seem to provide resistance to forward travel and slow down the snowmobile. However, I

20. have discovered that it speeds up the snowmobile for a reason I will now explain.

When a snowmobile, having skis of the construction just described, travels forwardly, snow becomes wedged into the space between the fins, and, since it has no place to go, it packs more firmly, causing that part of the ski which is directly beneath a connection to the ski mounting post axis to rise up vertically a slight distance beyond the general level of the snow alongside the ski.

This rising up of the ski from riding over the compacted

30. snow raises the forward end of the snowmobile causing the drive

track at the rearward end of the snowmobile, which latter is normally horizontal, to raise up at its forward end and to incline with respect to the horizontal all along the under-surface of the track so that the track tends to climb over the snow with greater ease and with lesser resistance in a manner somewhat similar to the greater speed of a motorboat at times when the forward end of the motorboat rises with respect to a water surface.

The previous discussion uses the horizontal as a plane
 10. of reference for easier explanation even though the benefits of this action apply also when a snowmobile is driven through snow that inclines either in uphill, downhill, or cross-hill travel.

SUMMARY OF THE INVENTION

A snowmobile having two forward skis which turn about ski-mounting posts in a manner causing lateral inclination of the respective skis, each ski having a pair of fins projecting downwardly at respective side edges thereof, each
 20. fin of the ski converging toward the other fin of the same
 20. ski at the rearward end thereof to compact snow under the ski so as to raise the forward end of the snowmobile, the said lateral inclination of a ski during turning causing one of its fins to be disposed lower than the other for having a greater effect, whereby its inclination with respect to a longitudinal axis of the ski causes the forward end of the snowmobile to turn and overcome the inclination to straight forward travel caused by downwardly depending central portions of the ski, whereby turning is much more effective and the compacted snow raising the forward end of
 30. the snowmobile causes an inclination of the forward end of

the drive belt reducing resistance to forward travel to produce a snowmobile that is both fast and maneuverable.

The snowmobile described further having a wheel specifically extending downwardly beyond said fins to protect said fins during travel over hard horizontal surfaces and to assist in making it easier for the snowmobile to be moved up a ramp.

The snowmobile described, the fins of which have teeth on their lower edges for biting into hard icy surfaces for greater effectiveness during turning.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a side elevation of a snowmobile with the rearward portion thereof broken away and the rearward track assembly thereof shown only diagrammatically.

Figure 2 is a sectional view of the ski portion of the snowmobile of Figure 1 shown with a supporting spring and the spring-mounting brackets removed for convenience of illustration; Figure 2 being taken along the line 2--2 of Figure 3.

20. Figure 3 is a top plan view of the ski which is closest to the viewer in Figure 1 with a central portion of the supporting spring being broken away.

Figure 4 is a diagrammatic view showing the ski of Figure 1 from its forward side as it would be seen when the snowmobile is making a turn, whereby it is laterally inclined with respect to the horizontal, which latter is generally represented by an upper surface of ice therebeneath.

DESCRIPTION OF THE PREFERRED EMBODIMENT

30. In Figure 1 the snowmobile of this invention is generally

indicated at 10 and comprises a chassis 12, a rearward portion of which is not shown.

The snowmobile has a rear track for driving the snowmobile shown at 20 and rear portions of the track and other portions of the track drive assembly are not shown.

The snowmobile 20 has a ski-mounting post 50 having a post-axis 54 inclining downwardly and forwardly from the chassis in a way conventional in the prior art.

At the lower end of the mounting post 50 a ski-axle 10. 60 is fixed, and the latter extends horizontally through openings in a pivot bracket 70 attached to the center of an arcuate spring assembly 74, which latter has its lower ends conventionally attached to a ski 90 by spring-attaching bracket assemblies 92 disposed forwardly and rearwardly of the ski-axle 60.

The ski 90 has a central portion having side edges 96 and 98 which are parallel with the ski axis 100 and which extend forwardly a short distance from the rearward end 102 of the ski. The central portion 95 can be thought of as 20. being disposed between imaginary extensions of the side portions 96 and 98 which extend in alignment therewith forwardly parallel to the axis 100 along imaginary lines 110 disposed to the right and left of the axis 100.

The central portion 95 can be thought of as having a shape substantially conventional having the majority of its undersurface horizontal as seen at 120, but with the forward end thereof up-turned as seen at 130.

The ski 90 and other conventional skis usually have a downwardly offset drop center portion 126; best seen in 30. Figure 2, extending substantially the length of the ski

for providing it with strength.

On the underside of the drop center portion 126 a wear bar 150 conventionally extends a substantial part of the length of the horizontal portion of the ski. Such wear bars are attached in many manners to skis and this is not a part of this invention, but for the purpose of illustration, welding is shown in Figure 2 at 164 making such a connection.

- As best seen in Figure 2, the dimension indicated at O
10. between the bottom of the ski center portion 95 and the bottom of the offset portion 126 is conventionally about five-eighths of an inch. The distance W from the underside of the offset portion 126 to the underside of the wear bar 150 is conventionally approximately three-eighths of an inch. By adding the dimensions O and W together, one can see that a substantial groove is being cut in the snow as the ski moves forward, as is a factor making it difficult to turn a conventional ski, and because of that, two inclined fins 200 are placed, one at the right, and one at the left, of the ski
 20. central portion 95 and are supported by what can be called fin-supporting wing areas 210 having upper portions 212 disposed horizontally and joined with horizontal adjacent portions of the central section 95 of the ski.

- Each fin-supporting wing portion 210 of this invention also has a downwardly extending outer edge 222 which is adapted to have a fin 200 of this invention attached thereto by means of spot weldings seen at 230 disposed connecting the horizontal upper edge 232 of each fin 200 with the outer side of the downwardly extending portion 222
30. outside of which laps.

The spot weldings 230 form a removable connection so that the fins 200 can be removed from the remainder of the ski when they are worn out and replaced with other fins, and yet be firmly attached during use.

- Each fin is disposed in a plane which inclines with respect to the vertical so that the lower end of the fin is disposed farther from the reference plane shown at 240 than is the lower edge of the ski as the ski is viewed on any cross-section taken in a vertical plane transversely through the ski at any place along the fins, when the reference plane in this definition and shown at 240, is defined as a vertical plane extending through the lateral center of the ski directly beneath the mounting post 50 when the ski is seen in lateral cross-section, as in Figure 2.

- When a vertical line called a fin inclination definition line 260 is drawn from any part of a fin 200 on the inner side thereof downwardly, then it will be seen that the closest part of the fin to the fin inclination definition line 260 will define with respect thereto an angle I , which latter is the angle of inclination I of a fin. This angle of inclination can vary considerably and still the fins will work and, for convenience of illustration, a sample inclination is shown which happens to be about 12° . The forward tip of each fin is disposed at a distance from the reference plane 240, when measured at the bottom of the respective fin, which latter distance D is approximately three and seven-eighths inches. The rearward end of the lower edge of each fin is spaced from the reference plane 240 a distance d which is three and one-eighth inches, whereby the rearward end of the lower edge of a fin is disposed closer to the reference plane 240 by a

distance which is, for example, three-fourths inch indicating a substantial inclination, since I have found these measurements satisfactory on a total fin length of thirteen inches for each identical fin.

The length of the horizontal portion of the ski is indicated at H in Figure 1 and is twenty-eight inches, the upturning of the ski, seen at 130 in Figure 1, has a length which is indicated at U and which is eleven inches.

10. I do not propose that my invention be limited to any of the figures discussed herein, as a matter of dimensions, and these dimensions and inclinations are given only by way of example.

I have found, for example, that an ideal distance from the rearward end 370 of the ski, as seen in Figure 1, forwardly horizontally to a line 372 extending through the lower end of the mounting post 50 is preferably a distance P of three inches, and that if this distance is excessively greatly reduced, compaction of the snow under the ski at the line 372, is insufficient, and if it is excessively great, the ski
20. becomes undesirably harder to turn.

Referring to Figures 1 and 2, it can be seen that the lower edge of each fin 200 is serrated by providing a series of equally spaced notches 400 therein to facilitate the cutting of a fin into an icy surface during turning. I have found that this cutting in, as is made possible by, in effect, making the lower edge of each fin into multiple cutting teeth 402, helps the fin have its effectiveness in causing the other parts of the ski to pull out of grooves that have been made in the surface over which the snowmobile is traveling.
30. I have found that a total fin length of thirteen inches

is effective in which the distance P in Figure 1 is three inches and the distance F is ten inches.

In operation, I have been amazed at how much better the steering is on either ice or snow by providing the fins of this invention with their inclination and position. This is made practical by the inclination of the mounting post 50. Such inclinations vary from snowmobile to snowmobile and the particular angle M shown in Figure 1 is 30° but the exact angle is not vital so long as there is adequate lateral inclining of the skis during a turn, a characteristic of snowmobiles which is commonly called "castoring".

As best seen in Figure 2, the fins 200 extend a substantial distance downwardly below the wear bar 150 and so they would drag on any hard surface such as a ramp over which the snowmobile might be moved. For this reason, and also to help protect the fins 200 from rocky surfaces, a wheel 500 is provided which extends downwardly through an opening 502 in the ski, the wheel 500 being mounted on an axle 510 having its ends welded at 512 to the sides of downwardly extending portions of a drop center 126 of the ski, whereby the axle 510, which is horizontal, extends along a central axis 530 of the wheel 500, with the wheel 500 rotating freely on the axle 510, with two collars 550 disposed at each end of the wheel and fixed to the axle 510 for preventing the wheel 500 from sliding along the axle 510.

The wheel 500 has a blunt outermost peripheral surface 570 which is disposed far enough from the axis 530 of the wheel so that the surface 570 is always disposed a substantial distance below the lowermost edges of the fins 200 so as to engage a ramp or rocky surface, holding the fins off

of the rocky surface or ramp and thereby protecting the fins.

Referring to Figure 4, the ski 90 is there shown from the front in a laterally inclined position assumed during turning, as above described, with one runner engaging an icy surface 642 and the line 640 indicating the amount of tilting which is common during "castoring".

In operation, referring to Figure 1, the numeral 700 indicates a line for indicating the general level of snow and a line 702 indicates a higher level at which the packed snow is disposed on which the underside of the ski 90 rides because of the wedging effect on snow of the inclined fins 200. In Figure 1 also can be seen that the forward portion of the underside of the track or belt 20 is raised up because the wedging of the snow raises the ski 90 which is raising the forward end of the snowmobile along with the right ski of the snowmobile, not seen in Figure 1 since it is behind the left ski which is seen.

This raising of the snowmobile at the forward end raises the forward portion of the underside of the belt 20 causing it to incline upwardly at the forward end thereof whereby it enables the belt to pass over snow with lesser resistance much as the raised forward end of an outboard motorboat allows the motorboat to go forward with less resistance. I have discovered that the greater speed made possible by this effect offsets the speed that is lost by the fact that the fins 200 incline with respect to the longitudinal ski axis 100, although some of this offset is probably due to the fact that the skis ride on the air that is in the fluffy snow which is wedged under the ski by the inclined fins.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A ski for a snowmobile comprising a central portion having a main section and a forward section, said forward section being attached to the forward end of said main section, said main section having a generally horizontal under surface, said forward section having an under surface upwardly inclining toward an upper forward end, said main section of said ski being elongated from front to rear and having a longitudinal ski-axis extending through an area-center of the under surface thereof in the direction of said elongation, an elongated first fin attached to said ski and extending downwardly from adjacent portions of said ski, said first fin being disposed to one side of said ski-axis as said ski is seen in bottom plan view, said first fin being elongated from a forward end thereof to a rearward end thereof, the lower edge of said first fin lying in a first plane which is inclined with respect to said axis gradually more toward said ski-axis at its rearward end and disposed at an acute angle with respect to said ski-axis, said ski having a second fin thereon similar to said first-mentioned fin and having a similar position on said ski as described for said first fin except that said second fin is on the other side of said axis from said first fin whereby

said fins each incline inwardly toward said axis and toward each other at their rearward ends, the rearward ends of said fins being spaced apart for allowing snow to pass therebetween, the forward ends of said fins being spaced apart a greater distance than the rearward ends of said fins whereby units of snow are received between the forward ends of said fins and said units each become packed between said fins as the ski passes over each of said units of snow, said packing causing the vertical height of each said unit of snow to increase as the fins pass by each snow unit since each said unit of snow is compressed from its sides into a lesser dimension laterally of said ski as said ski passes over it, the said increased vertical height tending to support said ski above the general level of surrounding snow higher than would be the case if said fins were not inclined forward to each other.

2. The ski of claim 1 in further combination with a snowmobile having a chassis and having a ski mounting post having a post-axis inclining downwardly and forwardly from said chassis, means attaching said ski to said post for the movement of said ski upwardly and downwardly at its ends about a pivot-axis at a right angle to said post so that said

ski tilts laterally as said post is turned about said post-axis, said fins being disposed substantially to one side of said longitudinal ski-axis so that when said post is rotated one of said fins becomes lower with respect to said chassis than the other fin for having the effect of engaging snow in a manner so as to turn said snowmobile more quickly.

3. The ski of claim 1 in which said ski turns about a generally horizontal pivot-axis and in which said fins have forward portions disposed forwardly of said pivot-axis which are substantially longer than rearward portions of said fins which latter are disposed rearwardly of said pivot-axis.

4. The ski of claim 1 in which said ski has a wheel means mounted thereon and extending downwardly beyond the remainder of said ski and beyond said fins as said ski is seen in side elevation.

5. The ski of claim 1 in which said ski turns about a generally horizontal pivot-axis and in which said fins have forward portions disposed forwardly of said pivot-axis which are substantially longer than rearward portions of said fins

which latter are disposed rearwardly of said pivot-axis, said ski having a wheel means mounted thereon and extending downwardly beyond the remainder of said ski and beyond said fins as said ski is seen in side elevation, said wheel means comprising a wheel extending through said ski substantially beneath said pivot-axis.

6. The ski of claim 1 in which said main and forward sections are made of metal and said fins are each made of separate pieces of metal from said main and forward sections, said fins being attached to said main and forward sections by removable means for replacement of worn fins by removal of said removable means, said removable means being spaced spot weldings.

7. The ski of claim 1 in which the bottom edges of said fins are generally horizontal when the underside of said main section is generally horizontal and in which the bottom edges of said fins have spaced notches therein to facilitate cutting into ice to control ski position during turning by pulling said ski out of groove means formed in the surface travelled over by other portions of said ski.

8. The ski of claim 4 in which outer peripheral surfaces of said wheel are blunt to avoid unnecessary wear.
9. The ski of claim 1 in which said fins incline downwardly and outwardly to the respective side of said ski for better grip on snow when said ski is tilted downwardly on that respective side.



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